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GB 1423687
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(54) Control circuit for multi-unit merchandising machine

(57) A control circuit for a multiple delivery unit merchandising machine in which each of the delivery unit drive motors is connected between a respective matrix column line and a respective matrix row line. The first actuation of a push-button array connects one of the matix column lines to one terminal of a power source. The second actuation of the push-button array connects one of the matrix row lines to the other terminal of the power source.

Fig 3

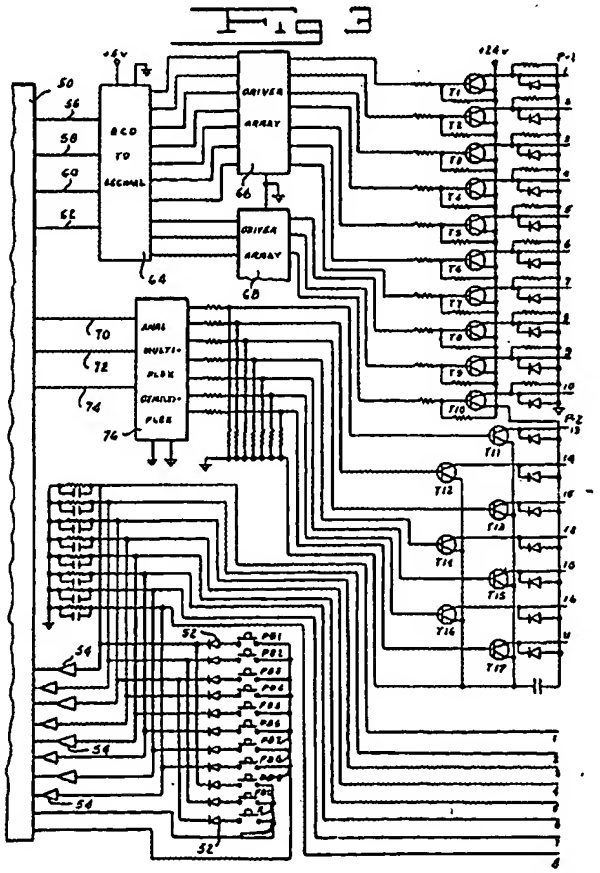

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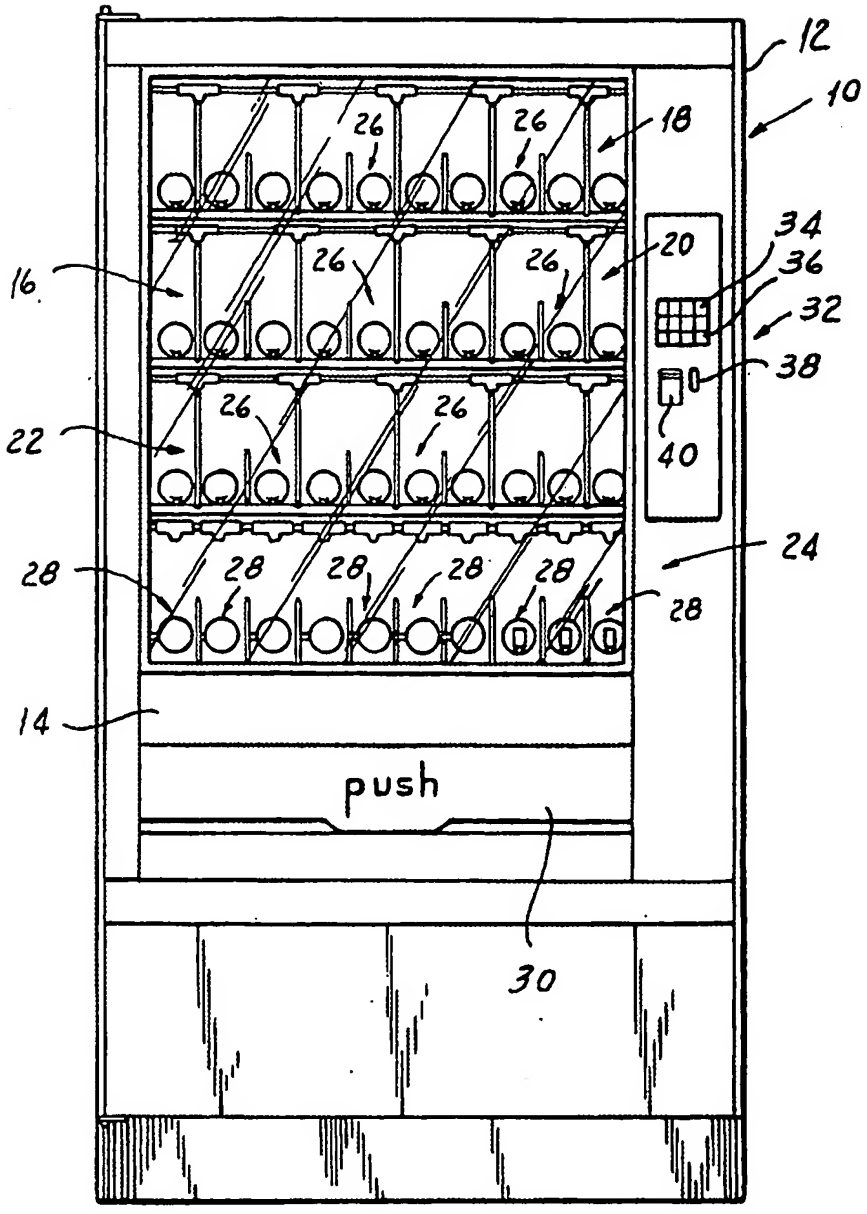
Fig 1



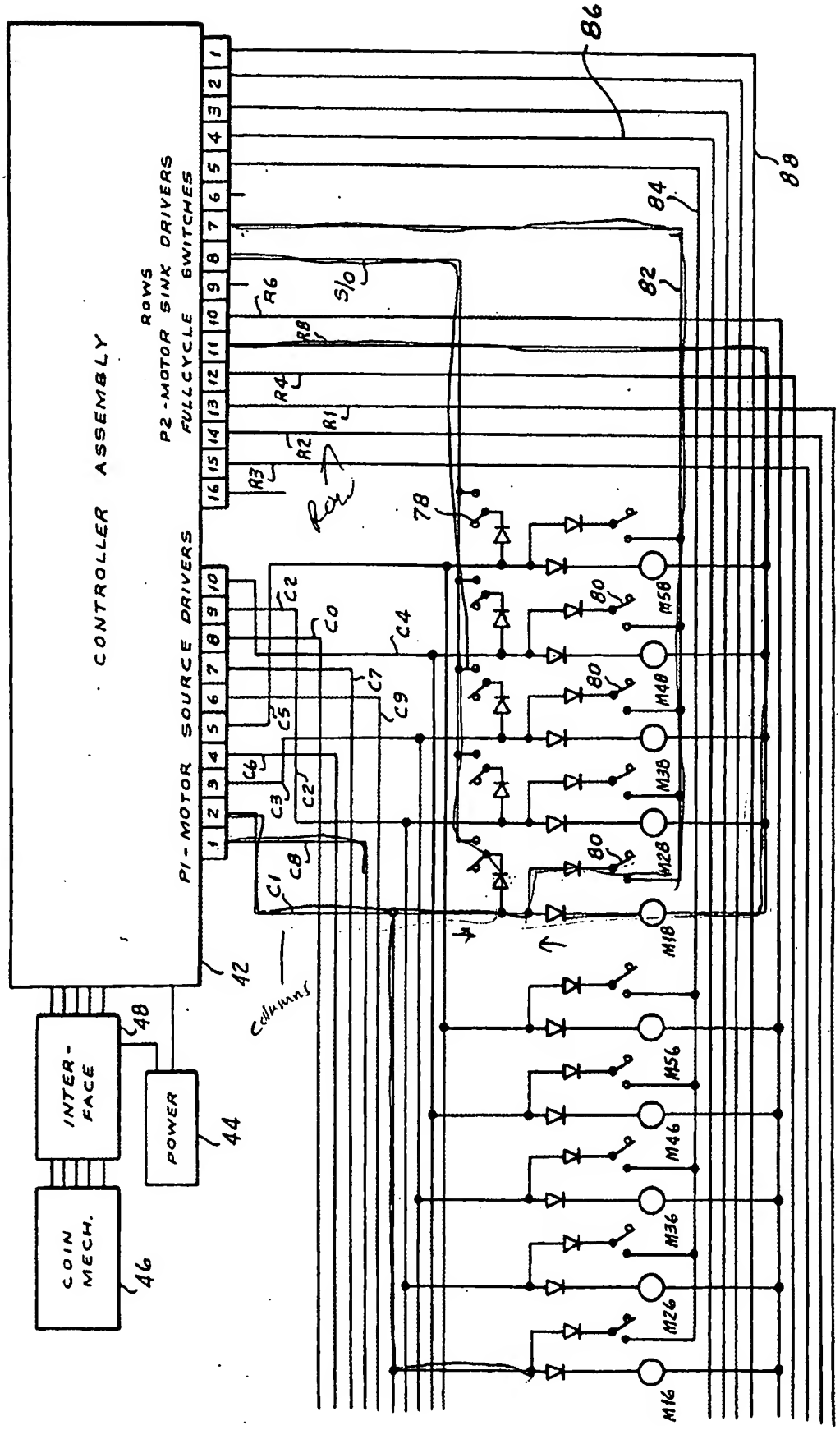

CONTROLLER ASSEMBLY
P1-MOTOR SOURCE DRIVERS
P2-MOTOR SINK DRIVERS
ROWS
FULLCYCLE SWITCHES
INTER-FACE
POWER
COIN MECH.
42
44
46
48
Columns
Rows
86
88
84
82
78
80
S/O
R1
R2
R3
R4
R6
R8
C0
C1
C2
C3
C4
C5
C6
C7
C8
C9
M18
M28
M38
M48
M58
M16
M26
M36
M46
M56

Fig 2A

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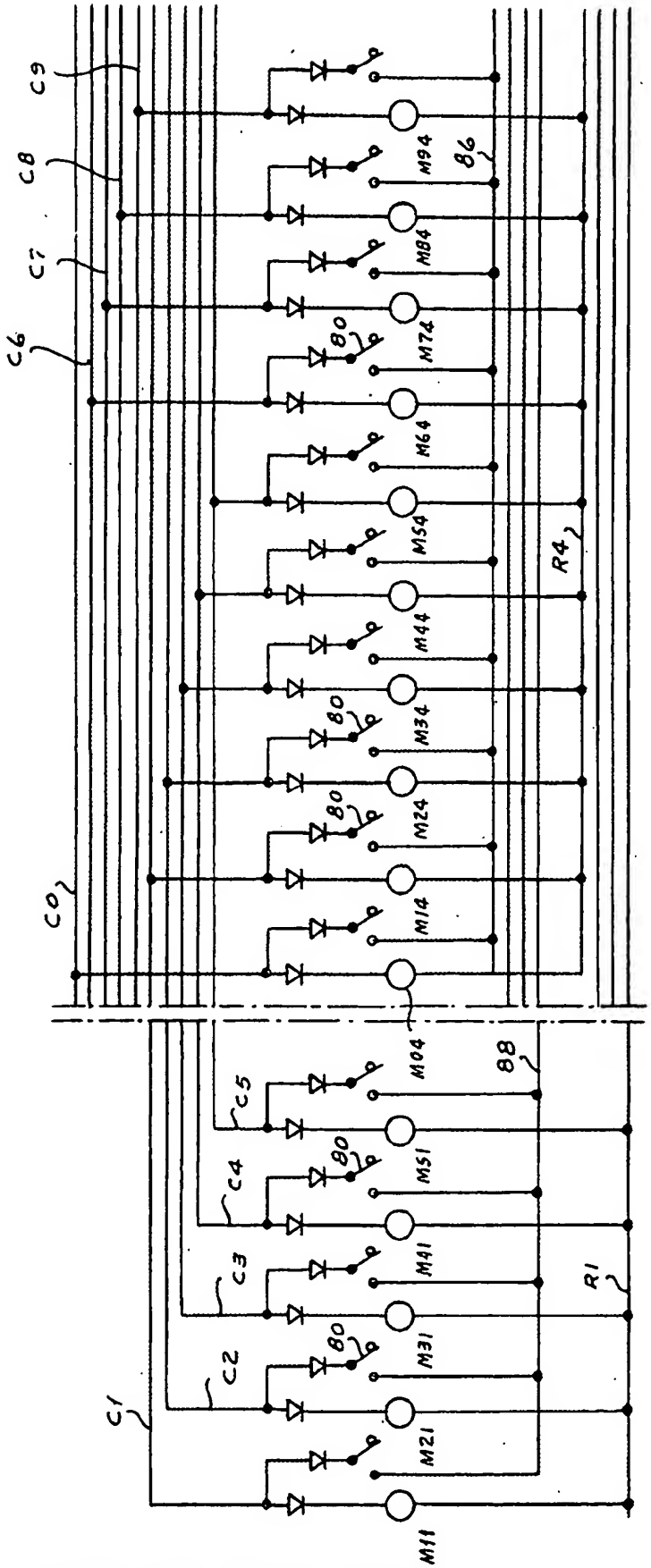

FIG 2B

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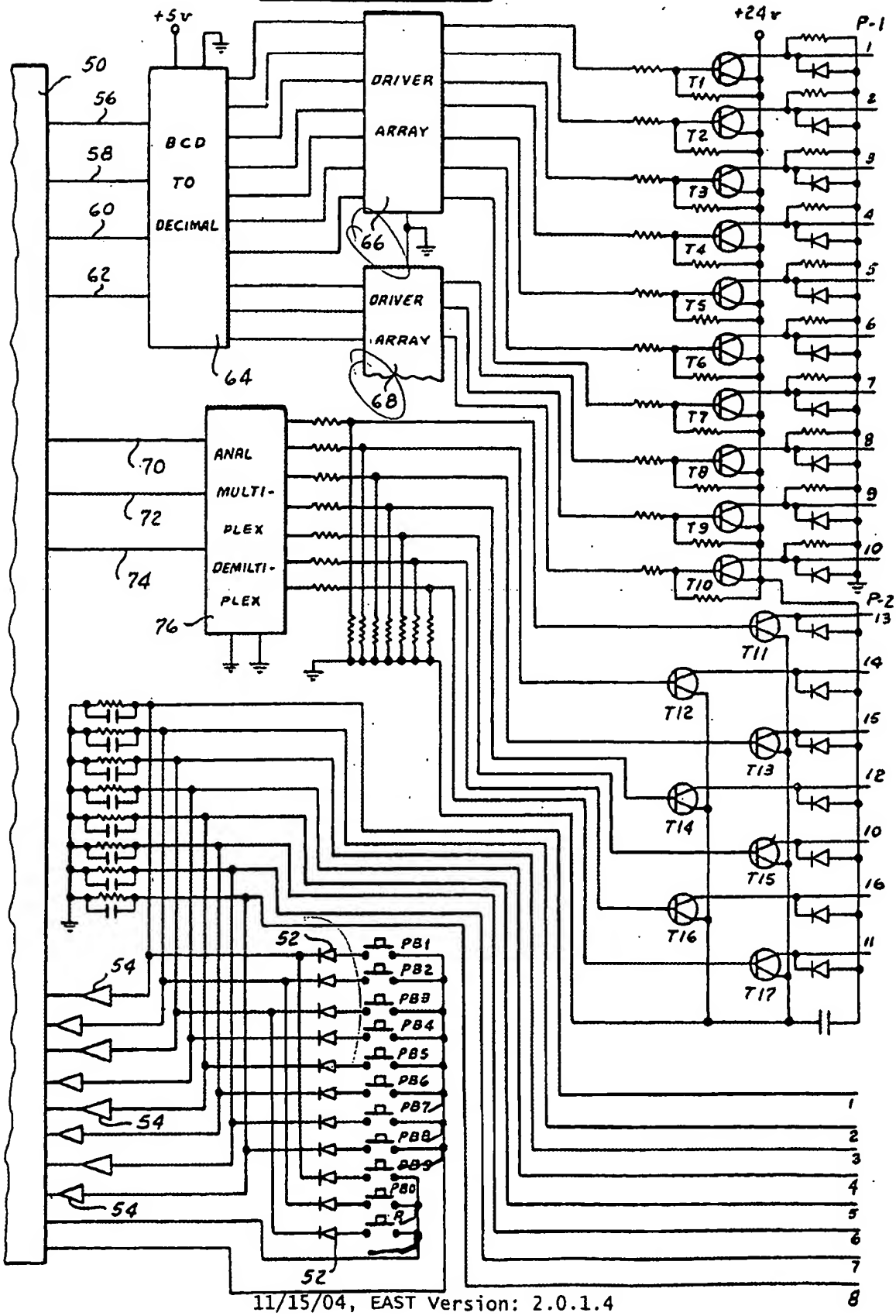
Fig 3



SPECIFICATION

Improved control circuit for multi-unit merchandising machine

The invention relates to the field of merchandising machines and, more particularly, to a simplified control system for a multiple unit merchandising machine.

There are known in the prior art merchandising machines of the type in which there are a multiplicity of units, each of which is provided with its own individual drive motor. Examples of such merchandising machines are the "spiral feed" machines in which each one of a number of levels in the machine has a plurality of helical storage and delivery means. Each of the helical members receives an article of merchandise to be dispensed between adjacent turns of the member. An individual drive motor for each unit is adapted to be energized to rotate the helical member to advance an article over the edge of the shelf to permit it to fall downwardly to a delivery area. Machines of this type in the prior art are provided with a number of selecting pushbutton switches equal to the number of individual delivery units of the machine.

One example of the merchandising machine of the type discussed above is disclosed in Desai *et al* Patent 4,354,613. The machine shown in the Desai *et al* Patent is controlled by a microprocessor. It includes a number of selection switches corresponding to the number of dispensing units in the machine. Upon actuation of a selection switch and after a check to see whether the cost of a selected item has been deposited, respective decoders put out row and column signals providing inputs to a matrix of motor driver circuits selectively to connect one terminal of one of the motors to a terminal of the power source, the other terminals of all of the motors being directly connected to the other terminal of the power source. It will readily be apparent that this machine requires as many motor driver circuits as there are motors to be driven.

One object of our invention is to provide an improved control circuit for multi-unit merchandising machines which is simpler than are control circuits for such machines in the prior art.

Another object of our invention is to provide an improved control circuit for multi-unit merchandising machines which requires fewer components than do circuits of the prior art for controlling such machines.

Still another object of our invention is to provide an improved control circuit for multi-unit merchandising machines which is more certain in its operation than are control circuits of the prior art for such machines.

Other and further objects of our invention will appear from the following description.

In the accompanying drawings to which reference is made in the instant specification and which are to be read in conjunction therewith and in which like reference characters are used to identify parts in the various views:

Figure 1 is a front elevation of a multi-unit merchandising machine provided with our improved control circuit;

Figure 2A is a fragmentary schematic view of a first portion of our improved control circuit for multi-unit merchandising machines;

Figure 2B is a fragmentary schematic view of the remainder of our improved control circuit for multi-unit merchandising machines; and

Figure 3 is a schematic view of the details of the controller assembly of our improved control circuit for multi-unit merchandising machines shown in Figure 2A.

Referring now to Figure 1 of the drawings, a multiple unit merchandising machine indicated generally by the reference character 10 with which our improved control circuit may be used includes a cabinet 12 provided with a door 14. A window 16 in the door 14 permits a prospective customer to view the various merchandise storage and delivery levels indicated generally by the reference characters 18, 20, 22 and 24 of the machine. By way of example, the three upper levels 18, 20 and 22 of the machine may include pluralities of double helix merchandise storage and delivery units 26. It will readily be appreciated that in such double helix units one drive motor is associated with each pair of adjacent helical members. These units may be adapted to store and dispense relatively larger packages such for example as bags of chips and the like. The lowest level 24 of the machine includes a plurality of single helix delivery units indicated generally by the reference character 28. These units may be arranged to store and dispense smaller articles such as bars of candy, gum and mint and the like.

Further, as is known in the art, when one of the storage and delivery units of the machine 10 operates to deliver an article of merchandise over its associated shelf the article falls downwardly into a delivery door assembly 30 from which it can be retrieved by the customer.

The machine 10 includes a push-button array panel indicated generally by the reference character 32 on which we mount ten selection push-buttons 34 and a reset push-button 36. Panel 32 also carries the coin slot member 38 in which coins are deposited when a purchase is to be made. The panel 32 further supports a coin return assembly 40 in the event a customer wishes to have his money returned before he has made a selection.

Referring now to Figure 2A, our improved control circuit for a machine such as the machine 10, includes a controller assembly 42 which receives power from a source 44. A coin mechanism 46 coupled to the controller with power from the source 44 provides both pricing and credit information to the controller assembly 42.

Referring now to Figure 3, the controller assembly 42 includes a microprocessor 50 of any suitable type known to the art, such for example as a Mostek 3870. In Figure 3 we have designated the selecting push-buttons 34 and the reset push-button 36 respectively as PB1 through PB0 and R. Switches PB1 through PB0 correspond respectively to the digits 1 to 9 and to 0. Operation of any one

of the push-buttons PB1 through PB0 and R provides an input to the microprocess 50 through an isolating diode 52 and an amplifier 54. In response to the first actuation of one of the push-buttons PB1 through PB0, the microprocessor 50 puts out a binary coded decimal signal on lines 56, 58, 60 and 62. In response to this signal, a binary coded decimal to decimal converter connected to a suitable sort of control voltage, such for example as 5 volts, puts out a signal on one of ten lines, the first seven of which are coupled by a driver array to the base inputs of respective transistors T1 to T7. The last three output lines from the converter 64 are coupled by a driver array 68 to the base input terminals of transistors T8 to T10. We connect the emitter terminals of all of the transistors T1 to T10 to a source of power of, for example, plus 24 volts DC. Voltage dividers connected between the power terminal and the output lines of driver array 66 and 68 cause the transistors to be rendered conductive when the output lines from the driver array 66 and 68 are grounded.

From the structure just described, it will readily be appreciated that upon operation of one of the push-buttons PB1 to PB0, one of the output conductors of driver arrays 66 and 68 will be grounded to render one of the transistors T1 to T10 conductive. When this occurs the 24 volt source is coupled to one of ten output conductors across a resistor and isolating diode. These conductors are identified as pins 1 to 10 of a pin array P1.

Upon the second actuation of a selecting push-button, the microprocessor 50 puts out a binary signal on conductors 70, 72 and 74 which signal is converted to a decimal signal by an analog multiplex-demultiplex circuit 76. In response to the output signal on one of the seven output lines of circuit 76, one of a plurality of transistors T11 to T17 is rendered conductive in a manner analogous to that described hereinabove in connection with transistors T1 to T10 to couple one of a number of output lines to ground. We have designated these output conductors as pins 10 through 16 of the second output pin array P2.

Referring again to Figure 2, we have designated output conductors from the respective pins 1 to 10 of array P1 by the reference characters C8, C1, C3, C6, C5, C9, C7, C0, C2 and C4. While this designation is relatively arbitrary, these conductors C0 to C9 can be considered to represent the ten columns of a matrix. In an analogous manner, we designate the output pins 10 to 15 of the pin array P2 as R6, R8, R4, R1, R2 and R3 corresponding to the rows of a matrix.

As has been explained hereinabove, upon a first operation of a selecting push-button, one of the pins 1 to 10 of array P1 is connected to a power source of, for example, 24 volts. Similarly, upon the second actuation of a push-button one of the pins 10 to 15 of the array P2 is connected to ground. We connect each of the respective dispensing unit drive motors between one of the column conductors C1 to C0 and one of the row conductors R1 to R4, R6 and R8. Thus, when the column conductor to which a motor is connected receives power from the source and the row conductor to which the same motor is connected is coupled to ground, that motor is energized. In Figure 2 we have designated each motor by the letter M followed by a two digit number, the first digit of which indicates the column conductor to which the motor is connected, and the second digit of which indicates the row conductor to which the motors are connected. Thus, motors M18 through M58 have first terminals connected to column conductors C1 to C5 and have second terminals all conducted to the same row conductor R8. By way of example, we have shown a row 8 including only five motors, a row 6 including five motors, a row 4 including ten motors, and a row 1 including five motors.

We provide a full cycle switch 80 associated with each of the motors 18. Once any motor begins to rotate in response to connection of its column conductor to the power source and its row conductor to ground, the associated full cycle switch closes to bypass the push-button switch array. More specifically, the full cycle switches 80 associated with motors M18 to M58 complete circuits from the column conductor C1 to C5 to a line 82 leading to the pin 70 of pin array P2. The switches 80 associated with motors M16 to M56 complete circuits to a conductor 84 connected to pin 5 of the pin array P2. The switches 80 associated with motors MO4 to M94 complete a circuit to a conductor 86 leading to pin 4 of the array P2 while the switches 80 associated with motors M11 to M51 complete a circuit to conductor 88 leading to pin 1 of the array P2.

It will be seen that the pins of the array P2 to which the full cycle switch lines are connected are in turn connected to the input amplifiers 54, thus to bypass all of the push-button switches until the motor which has been energized completes a full cycle of operation.

We may provide one or more of the dispensing units with a "sold out" switch 78 which is actuated when the unit is sold out to provide a feedback signal to the controller assembly upon energization of the column line with which the unit is associated, thus to prevent operation of the machine and to indicate the sold out condition.

In operation of our improved control circuit for a multiple unit merchandising machine, on "power up" the microprocessor 50 turns on the transistors T1 to T17 one at a time and checks to see if any other transistor is shorted "on", which condition would allow a product to be vended when it is not supposed to be. If a shorted transistor is discovered in this manner, microprocessor 50 automatically shuts the machine down. If a sum in money aggregating the purchase price of an article has been deposited, upon the actuation of the push-buttons 34 corresponding to that selection microprocessor 50 turns on the associated motor to dispense the product. The microprocessor 50 times the motor so that the correspond-ing full cycle switch must close within approximately one second of startup and the vend cycle itself must take no more than ten seconds. If either of these two

conditions is not met the microprocessor 50 calls it a "stall" condition, shuts off the motor in question, and allows the customer to make another selection. When the machine is not in an actual dispense cycle, power to the motors is shut off to minimize the possibility of a malfunction caused by a shorted transistor. The motor arrangement of the motors enables us to control up to seventy motors with the use of only seventeen transistors.

It will be seen that we have accomplished the objects of our invention. We have provided an improved control circuit for multiple-unit merchandise dispensing machines which is simpler than are control circuits of the prior art for such machines. Our improved circuit employs fewer parts than are required for such machines in the prior art. It is more certain in operation than are circuits of the prior art used for such machines.

It will be understood that certain features and subcombinations are of utility and may be employed with-out reference to other features and subcombinations. This is contemplated by and is within the scope of our claims. It is further obvious that various changes may be made in details within the scope of our claims. It is, therefore, to be understood that our invention is not to be limited to the specific details shown and described.

CLAIMS

1. A control circuit for a merchandising machine having a multiplicity of individual dispensing units, each of which has an individual drive motor adapted to be connected across a power source in the course of a dispensing operation including in combination, a plurality of first control devices adapted to be energized res-pectively to connect first terminals of said motors to one terminal of said source, a plurality of second control devices adapted to be energized respectively to connect second terminals of said motors to the other terminal of said source, selecting means, and means res-ponsive to actuation of said selecting means for energiz-ing one of said first control devices and one of said second control devices.

2. A control circuit as in claim 1 in which said means responsive to actuation of said selecting means comprises means responsive to a first actuation of said selecting means for energizing one of said first control devices and means responsive to a second actuation of said selecting means for energizing one of said second control devices.

3. A control circuit as in claim 2 in which said selecting means comprises an array of push-button switches.

4. A control circuit as in claim 3 in which said control devices comprise a plurality of normally non-conductive transistors.

5. A control circuit for a merchandising machine having a multiplicity of individual dispensing units each of which has an energizable drive means for operating the unit including in combination a plurality of matrix column lines, a plurality of matrix row lines, means for connecting each of said individual dispensing unit drive means between a respective one of said column lines and a respective one of said row lines, a source of power, selecting means and means responsive to actuation of said selecting means for connecting one of said column lines and one of said row lines to said source.

6. A control circuit as in claim 5 in which said selecting means comprises an array of push-buttons, said means responsive to actuation of said selecting means comprising means responsive to a first actuation of said push-button array for connecting a column line to said source and means responsive to a second actuation of said push-button array for connecting a row line to said source.

7. A control circuit as in claim 5 in which said means responsive to operation of said selecting means comprise a first plurality of control devices connected respectively between said source and said column lines and a second plurality of control devices connected res-pectively between said row lines and said source.

8. In a control circuit for a merchandising machine having a merchandise delivery unit drive member, apparatus including a source of power, a first normally non-conductive control device connected between one terminal of said source and said drive member, a second normally non-conductive control device connected between the terminal of said device and said drive member, a push-button array, means responsive to a first actuation of said push-button array for rendering said first control device conductive and means responsive to a second actuation of said array for rendering said second control device conductive.

9. A control circuit for a merchandising machine substantially as hereinbefore described with reference to the accompanying drawings.

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